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SECTION OF GEOLOGY AND MINERALOGY

MARCH 4, 1940

DOCTOR EDWIN D. MCKEE, Yale University: *Permian Deposits of the Arizona-Utah Basin.* (This lecture was illustrated by lantern slides.)[1]

The Paleozoic depositional basin located in what is now northern Arizona and southern Utah was an eastward extending embayment subsidiary to the great north-south trending geosyncline of the Nevada area. For every thousand feet of sediment deposited in the main trough during this era, only a few hundred feet of material was laid down in this area to the east. During parts of the Cambrian, Devonian, Mississippian and Permian periods, seas spread from Nevada across it, and marine deposition took place in these. During parts of the Permian period extensive continental sediments also were laid down in the area. However, at most other times (Upper Cambrian, Ordovician, Silurian, Upper Mississippian and early Pennsylvanian) no sediments corresponding to those deposited in the Nevada geosyncline were accumulated in the less developed basin of Arizona and Utah.

[1] This lecture was announced under the title "Middle Permian Seas of Northern Arizona."

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Paleozoic seas advancing eastward into the Arizona-Utah basin extended at no time farther than the eastern limits of these states, although some continental sediments were deposited in the area beyond. The southern limits of the basin were also clearly defined, for in central Arizona there is a granitic positive element, called Mazatzal-land, which successfully separated most of the corresponding faunas and sediments of northern and southern Arizona during the Paleozoic. On the other hand, even though some of the clastic sediments deposited in the basin were derived from the north, its boundaries in that direction are not well known because of a lack of exposures in central Utah. In this Arizona-Utah basin, by far the greatest accumulation of sediments was during the Permian period when strata 2,500 feet thick, both continental and marine, were laid down, leaving a record which today is beautifully exposed in the walls of Grand Canyon and other canyons of the plateau region.

In the classical Grand Canyon section and elsewhere throughout a wide area, the Permian formations, from bottom to top, consist, first, of two series of red beds of deltaic origin; next, of an aeolian sandstone; and, finally, of two series of cyclic deposits which are largely of marine origin. Detailed studies of all five of these major subdivisions have been undertaken with a view toward demonstrating the nature both of the vertical and of the lateral changes within and between them, of emphasizing the principal contrasts resulting from the different types of environment which they represent, and of determining criteria for the recognition of each. These studies have consisted chiefly of a detailed tracing of beds by means of carefully measured sections and of statistical analyses of cross-lamination patterns in various units. They have been supplemented in certain critical horizons and localities by mechanical and chemical analyses, by thin-section and polished surface examination and by paleontological studies.

In the two red-bed formations which make up the lower portion of the Permian section, it has been possible to demon-

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strate through detailed studies of the cross-lamination many features regarding the directions of movement among the sediments and concerning the general character of deposition on the delta surfaces. Some measure of the rapidity of delta growth has been ascertained by detailed examination of the cyclic character of the sediments; data on the nature of lateral changes toward marine facies, through the tracing of beds. On these latter problems much remains to be done.

The aeolian sandstone in the middle of the section provides an excellent example of a desert dune deposit, and so makes an especially interesting comparison with formations representing other sand environments. The general character of the dunes and the regional direction of their movement have been determined and data have been obtained which help to differentiate this type of deposit from analogous ones.

The two uppermost formations are different in many details, but have in common the fact that both are composed of varied types of sediments which were deposited during the stages of an advancing and retreating sea. Furthermore, it is possible to subdivide each of these formations into natural lateral units or facies based on observable changes in fauna and lithology. Special attention has been given the distribution—in relation to facies and horizons—of gypsum deposits and of both bedded and nodular chert, and it has been found that most evidence favors a primary origin in each case. The distribution of the magnesium content in the limestones also suggests a relationship with the environment of deposition.

The Permian basin deposits of northern Arizona offer exceptional opportunities for detailed work, both because of the unique character of the exposures and because of the contrasts in the types that are represented. When these formations have been studied in sufficient detail, they should serve to demonstrate many of the principles of stratigraphy and sedimentation which are less completely available for study in other regions.

SECTION OF BIOLOGY

MARCH 11, 1940

PROFESSOR E. R. DUNN, Haverford College: *Some Aspects of Herpetology in Lower Central America.* (This lecture was illustrated by lantern slides.)

The herpetological fauna of Nicaragua, Costa Rica, and Panama is very rich, consisting as it does of 7 orders, 26 families, 124 genera, and 375 distinguishable forms. Almost the entire fauna can be found in the area between the Canal Zone and the Costa Rica-Nicaragua border. Nicaragua has only 4 genera and 24 species which do not occur in Costa Rica, and Darien has only 6 genera and 28 species which are not found in the Canal Zone to the west. The important barrier is the mountain mass on the Panama-Costa Rica border, and therefore Costa Rica and western Panama together have a fauna richer in families and genera than the areas immediately to the north and south. There are no endemic families in the central area and only one endemic genus, but no less than 157 species are endemic. I cannot as yet account for this richness in species, nor for the amount of specific endemism.

The fauna of the Pacific side savanna country has affinities with that of the Caribbean coast of South America, which likewise has a marked dry season. The fauna of the Atlantic side rain-forest has affinities with that of the Pacific coast rain-forest of Colombia. There is thus a faunistic crossing over in the Canal Zone and in Darien.

The fauna of the adjacent islands is a depauperate mainland one. The fauna of the Greater Antilles is likewise depauperate as compared to that of the mainland. Two orders, 10 families, and 100 genera are not represented there. This marked decrease is thought to be evidence against former land connection. About half the Greater Antillean fauna may be derived from that of the opposite mainland of northern Central America and Mexico. About a quarter of the

fauna is derivable from forms which now reach their northern limit in Panama or in Costa Rica. The remainder cannot be derived from any forms now in North America. This is thought to indicate a considerable southward movement of the mainland fauna.

In Lower Central America the climatic and botanical areas are wet tropics (rain-forest), wet and dry tropics (monsoon forest, savanna), and wet temperate (fog-forest). Ecologically, there are two terrains in the tropical forested regions. One includes the baseleveled regions on the flood plains of the larger rivers; the other is the hilly or mountainous country not yet reduced to base level. In the former, there is some open country along the streams and much still water. In the latter, there is little open country and the processes of erosion in the humid tropics produce very steep slopes and gully formation down to bed rock. There is, therefore, very little still water and the ravines are not safe habitats for aquatic animals. In these areas there are no water snakes and frogs have adopted many methods of avoiding water in the early stages of their life histories. This ecological analysis is believed to be true for the forested tropics in general. There seems no good evidence for an amphibian or reptile fauna restricted to the higher levels of the trees.

Study of some 9,500 snakes from four Panamanian areas, collected at random for census purposes, indicates that the dominate snake species differ from area to area, although the areas may have similar conditions and a similar list of snake species. In each area a few forms are abundant and the rest are rare. Roughly, 10% of the species make up half the population; while half of the species make up 5% of the population. This situation has been found to characterize all snake faunas examined (in other tropical areas, San Diego Co., Cal., and Eastern United States). A species may be generally abundant without being dominant anywhere; it may be dominant in one area and extremely rare everywhere else; but there is some correlation between dominance and wideness

of range. Data over a series of years show fluctuations as well as steady increases in some species, and steady decreases in others.

The data from these snakes indicate that there is no correlation between number of species in a group and abundance of individuals of that group in nature.

SECTION OF PSYCHOLOGY

MARCH 18, 1940

DOCTOR KURT GOLDSTEIN, Montefiore Hospital, New York, N. Y.: *Significance of Speech Disturbances for Normal Psychology.* (This lecture was illustrated by motion pictures.)

The following explanations will take into consideration only such pathological findings which are related to two special problems in the psychology of speech:—(1) the problem of meaning of words; (2) the significance of "speech automatisms."

There are psychologists who deny that there is such a phenomenon as the meaning of words. To them words are nothing but associations between sounds or movements and objects or situations. Speech, then, would be a kind of conditioned response.

To prove that such an assumption is incorrect, there are no more suitable data than the behavior of aphasic patients whose words have lost meaning. Let us begin with a simple example.[1] There lies on the table a heap of colored woolen skeins of many colors and different shades. A normal person, asked to pick out all reds or all greens, picks all the various shades belonging to red or green. The patient, however, picks up only one or a few very similar skeins of the named color. It appears that the word, "green," fits for him only one special object or very few of close similarity. When the patient is asked to name the various colors, he calls only a very few skeins "green" or "red." He is not able to name at all the other shades of the same hue, or he calls them by special names which fit the special appearance of the individual color (*i.e.*, "light green," "moss green," "this is the color of the leaves," etc.). Faced with all the color shades

[1] K. Goldstein: The Problem of the Meaning of Words Based Upon Observation of Aphasic Patients. *Jour. of Psychol.*, 2, 1936.

which we call green, he denies that one can call them all green. The patient shows the same behavior as to other objects. Asked for the name of an object (knife), a woman-patient called it either an apple-parer, or a bread-knife, or a pencil-sharpener or a potato-pealer, according to the various situations in which the same knife was presented to her. A knife together with a fork, she called "knife-and-fork," and she objected to speaking simply of a knife in various situations, as, for example, in connection with an apple or a pencil. This incapacity to use the same word in different situations manifests itself particularly when the patient has to deal with words which have several meanings and a different meaning in different situations. A good example, for instance, would be the many meanings of the word "bar." The patient might be able to utter such a word in one of its various connections, but immediately thereafter, he would be unable to use or understand it in one of the other senses. We might say that the patient seems to be able to use words only if they were associated with a definite individual object or situation. He has only individual words, belonging to an object like other properties, *e.g.*, color, form, etc., but he cannot use the word if it merely represents the abstract class or category under which the object in question may be classified. He cannot use words as symbols. The words have lost meaning in themselves.

This speech defect goes along with an impairment of the conceptual approach toward the world in general.[2] The patient uses objects only as means for concrete activities, not as examples or representations of a class. This behavior of the patients becomes especially clear in their reaction to some special tests,[3] which the author has contrived for investigations of the impairment of the "categorical" or "abstract" attitude (Color Sorting Test, Object Sorting Test, Block

[2] K. Goldstein: The Significance of the Frontal Lobes for Mental Performances. Jour. of Neurol. and Psychopath., XVII. 1936.

[3] K. Goldstein and M. Scheerer: Abstract and Concrete Behavior. An Experimental Study with Special Mental Test. (In print.)

Design Test, etc.). The loss of meaning of words and the impairment of the abstract attitude and reduction to a more concrete level of behavior is, in the speaker's opinion, based on one and the same *change of the personality as a whole.*

The significance of words becomes obvious when one considers the peculiarities which speech shows under this condition. The whole language is changed from an active, spontaneous *productive means* for expressing ideas, feelings, etc., to a passive, more or less compulsive, stereotyped, and unproductive *reaction.* The amount of speech is generally reduced, especially spontaneous speech. The patients have the greatest difficulty in beginning to speak. Speaking has to be elicited through outside stimuli. When stimulated to speak, the patients have difficulty in stopping and use many stereotyped utterances, etc.

One especially interesting consequence of the modified character of speech is the fact that the patients have the greatest difficulty in *speaking so-called senseless sentences,* or even to repeat them on request. For example, such as are in contrast to a given situation or to their knowledge. One of my patients was unable to repeat the sentence: "It is raining today" on a day of sunshine; or to repeat "The snow is black," or "2×2 are 5." Such patients cannot understand how to say so-called senseless things because it is possible to understand senseless sentences only if one can abstract from the given situation or from experienced facts.

The great change in the patient's world involved in this loss of the meaning of words, as such, would make the patient totally helpless if he did not retain, from the time before the onset of the disease, many automatisms, with the help of which he can come to terms with his environment even though he has no real consciousness of their action, which would naturally require abstract mental power.

Analysis of these automatic speech reactions reveals to how great a degree the speech of adult human being is independent of his *personality* core, and discloses the associa-

tive character of much of his speech. One especially interesting example are the vocabularies which we acquire in learning a foreign language. So long as we have no real understanding of the foreign language we acquire the words only in their superficial connection with the words of our own language. We know that these words belong to a definite situation and are able to use them correctly without having a real understanding of their meaning. However, this is the case only in these situations. We make many a mistake as the consequence of the fact that we utter them in situations where they do not fit, because we have no real insight as to their meaning. The situation changes when we have acquired a real conception of the foreign language, so that we understand the fundamental meaning behind its words. Then the words achieve an absolutely different character. They become representatives of the categorical approach to the surrounding world, and then only, one is justified to speak of mastering the language.

Pathology teaches us further how strongly these automatic reactions depend upon the categorical attitude, both for their *acquisition,* as well as their *preservation* in memory.

The speaker pointed to the practical and theoretical consequences of the pathological findings for the customary theory of association and conditioning, and the implications of his results as affecting the theory of learning and the origin of speech in the history of man. He comes to the conclusion that human language and meaning cannot be separated. Human language is never a merely external association. Language involves a special attitude toward the world,—that attitude in which the individual is detached from a given condition, *i.e.,* the attitude characteristic of the human being. *When first there was a human being, there was meaningful speech.* This does not mean that normal language is always meaningful speech and that normal performances are carried out exclusively on the basis of the abstract attitude. In ordinary life, the concrete behavior plays a very great part and most of our performances are carried out in a concrete way.

But the mental set-up which these performances require as their conditional background is the abstract attitude. Otherwise, we would simply be robots or behave like the patients above described. Thus, the abstract attitude is essential to the human being. Its importance can be nowhere grasped so clearly as in the change of the behavior in patients under observation; in their lack of activity, creativeness, freedom, social adaptation, and in the changes of their language.

The speaker finished with some remarks concerning the relationship between the findings in the patients and observations on so-called primitive people. He pointed to the similarities with respect to behavior in general and speech in particular, but rejects the assumption that primitive people represent a defective condition like that of the patients above described, or a less developed kind of human beings, or that their capacities are of a degree inferior to those of "civilized" people. That "primitive" people behave concretely is no justification for assuming that they are not able to behave in other ways under varied conditions. The investigations, with our tests, in normal persons belonging to our culture are very instructive in this respect. Not seldom do we observe that very intelligent persons show a preference for concrete responses in these tests. However, these subjects are able to shift from the concrete to the abstract procedure if asked to do so, or if the problem so demands it. This is the decisive difference between the normal person and the patient, since the patient cannot shift to the abstract approach, which he has lost, and it is also my opinion that this is the difference between primitive people and our patients. The reason for the concreteness evidenced in both is totally different in the two cases. The patients are forced to react concretely because of a defect in their capacities. Primitive people prefer the concrete behavior because of the special form of their culture and because it usually does not demand the activation of abstract behavior. Why this latter is the case, is a question which involves another problem very well worth discussion, and which cannot be dealt with at the present time.

NEW MEMBERS

Elected March 4, 1940

SUSTAINING MEMBERS

Eising, Eugene H., M.D., Surgeon, New York City.

Grace, Arthur William, D.P.H., D.T.M. and H. (England), Professor, Dermatology and Syphilology, Long Island College of Medicine, Brooklyn, N. Y.

ACTIVE MEMBERS

Adamic, Louis, Writer, Milford, New Jersey.

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